REMARKS:

Specification

The applicant has taken the opportunity to reformat the specification. By way of explanation, the amendments which have been made to the specification update the table of cross-referenced, simultaneously filed, patent applications. On 10 July 1998, 184 patent applications were filed simultaneously by the applicant at the USPTO covering many different inventions made as part of a complex digital imaging and printing project. The present application is one of those 184 simultaneously filed applications. Those simultaneously filed applications were initially identified in the originally filed specification by their docket numbers of the US filing and for additional identification purposes by their corresponding Australian provisional patent application numbers and filing dates. The reason for identifying the cross-referenced application in this way was simply because, at the time of filing the present application, the US filing details of the simultaneously filed applications, having been filed on the same day as the present application, were not yet known or available.

Now that the US application numbers are known and in order more clearly to identify the cross-referenced applications, the US application numbers have been added in addition to the Australian provisional application numbers.

Further, the change to the format of the charts from landscape view to portrait view was made purely to make it easier to read the specification.

A substitute specification is attached. Also, marked up copies of the amended pages of the substitute specification are attached. No new matter has been added.

Claims

The claimed invention is directed to a digital hand held camera which includes an image sensor for sensing an image, a modification means which can have modification instructions uploaded from an input means which is a built-in part of the cameral itself with the modified image then printed out through an output means wherein specifically the modification means includes processing elements arranged around a central crossbar switch.

The Action rejects claims 1-4 and 6-10 under 35 USC 102 (b) as being anticipated by Gove et al (US Patent 5,768,609). The claims have been amended to more clearly define the invention disclosed and to refer to a hand held camera incorporating inter alia a modification means made up of processing elements connected by a crossbar switch. The camera has an image sensor; means for inputting modification instructions for use by said modification means and output means to print out the image after being modified. Gove et al on its own does not disclose such an invention as claimed by claim 1. While Gove et al may disclose an integrated circuit for image processing having a crossbar switch as a part thereof it does not disclose in the one unit an image sensor combined with modification means having an input means for providing modification instructions and an output for printing out the result of the image modified by the modification instructions. As is apparent from the examples shown in Figures 46, 48, 49, or 51 inter alia, the devices are separate integers variously distributed whether locally or remotely in order to make up a system that incorporates the disclosed image processing components. The claimed invention is a compact portable camera with self contained processing capabilities and facilities for the camera to be programmed "in the field". Such claimed invention is not disclosed in Gove et al. as required under 35 USC 102 (b).

Moreover, Gove et al. does not meet the provisions of 35 USC 102 (b)as it was **published or granted** on 16 June 1998 which was not more than a year prior to the filing of the present application which was filed 10 July 1998 based on the priority claim under 35 USC 119 of July 1997, receipt of documents in support of which have been acknowledged as received. The Applicant has responded assuming the objection was intended to be based on 35 USC 102 (e).

In view of the foregoing it is respectfully contended that all claims now pending in the above identified Patent Application recite a novel and not obvious camera which is patentably distinguishable over the prior art. Accordingly, withdrawal of the outstanding rejection and the allowance of all claims now pending are respectfully requested and earnestly solicited.

Very respectfully,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Specification

Due to the large number of pages in this specification only marked-up copies of pages that have been amended are enclosed. No new matter has been added.

In the Claims

Claims 1 to 10 have been amended as follows:

1. (Amended) A hand held digital camera [system] comprising:
[a] an image sensing means for sensing an image; modification means for modifying said sensed image in accordance with modification instructions input into said camera from an inbuilt input means; and
an output means for printing out[putting] said modified image;
wherein said modification means includes a series of processing elements arranged around a central crossbar switch.

2. (Amended) A hand held digital camera as claimed in claim 1 wherein said processing elements include an Arithmetic Logic Unit (ALU) acting under the control of a microcode store wherein said microcode store comprises a writeable control store.

3. (Amended) A hand held digital camera as claimed in claim 1 wherein said processing elements include an internal input and output FIFO for storing pixel data utilized by said processing elements.

4. (Amended) A hand held digital camera [system] as claimed in claim 1 wherein said modification means is interconnected to a read and write FIFO for reading and writing pixel data of images to said modification means.

5. (Amended) A hand held digital camera as claimed in claim 1 wherein said processing elements are arranged in a ring and each element is also separately connected to its nearest neighbours.

6. (Amended) A hand held digital camera as claimed in [any one of]claim[s] 2 [to 5] wherein said ALU [accepts] includes a series of inputs interconnected via an internal crossbar switch to a series of core processing units within said ALU.

7. (Amended) A hand held digital camera as claimed in claim 6 wherein said core processing units include at least one [one] of a multiplier, an adder and a barrel shifter.

8. (Amended) A hand held digital camera as claimed in claim 6 wherein said ALU includes a number of internal registers for the storage of temporary data.

9 (Amended) A hand held digital camera as claimed in claim 1 wherein said processing elements are further connected to a common data bus for the transfer of pixel data to said processing elements.

10. (Amended) A hand held digital camera as claimed in claim 9 where said data bus is interconnected to a data cache which acts as an intermediate cache between said processing elements and a memory store for storing said images.

In the Abstract

The Abstract has been amended as follows:

A digital camera [system comprising] has a sensor[ing means] for sensing an image [;modification means], a processor for modifying the sensed image in accordance with [modification] instructions input into the camera[;] and an output [means] for outputting the modified image [;] where[in] the [modification means] processor includes a series of processing elements arranged around a central crossbar switch. The processing elements include an Arithmetic Logic Unit (ALU) acting under the control of a writeable microcode store, [wherein the microcode store comprises a writeable control store. The processing elements can include] an internal input and output FIFO for storing pixel data [utilized] to be processed by the processing elements and the [modification means] processor is interconnected to a read and write FIFO for reading and writing pixel data of images to the processor [modification means]. Each of the processing elements can be arranged in a ring and each element is also separately connected to its nearest neighbours. The ALU [accepts]

receives a series of inputs interconnected via an internal crossbar switch to a series of core processing units within the ALU and includes a number of internal registers for the storage of temporary data. The core processing units can include at least one [one] of a multiplier, an adder and a barrel shifter. The processing elements are further connected to a common data bus for the transfer of a pixel data to the processing elements and the data bus is interconnected to a data cache which acts as an intermediate cache between the processing elements and a memory store for storing the images.

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TITLE OF INVENTION

"DIGITAL CAMERA SYSTEM CONTAINING A VLIW VECTOR PROCESSOR"

INVENTOR:

Kia Silverbrook

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CROSS REFERENCES TO RELATED APPLICATIONS

The following Australian provisional patent applications are hereby incorporated by cross-reference. For the purposes of location and identification, US patent applications identified by their US patent application serial numbers (USSN) are listed alongside the Australian applications from which the US patent applications claim the right of priority.

Cross-Referenced Australian Provisional Patent Application No.	US Patent/Patent Application (Claiming Right of Priority from Australian Provisional Application)	Docket No.
PO7991	09/113,060	ART01
PO8505	09/113,070	ART02
PO7988	09/113,073	ART03
PO9395	6,322,181	ART04
PO8017	09/112,747	ART06
PO8014	09/112,776	ART07
PO8025	09/112,750	ART08
PO8032	09/112,746	ART09
PO7999	09/112,743	ART10
PO7998	09/112,742	ART11
PO8031	09/112,741	ART12
PO8030	6,196,541	ART13
PO7997	6,195,150	ART15
PO7979	09/113,053	ART16
PO8015	09/112,738	ART17
PO7978	09/113,067	ART18
PO7982	09/113,063	ART19
PO7989	09/113,069	ART20
PO8019	09/112,744	ART21
PO7980	6,356,715	ART22
PO8018	09/112,777	ART24
PO7938	09/113,224	ART25
PO8016	6,366,693	ART26
PO8024	09/112,805	ART27
PO7940	09/113,072	ART28
PO7939	09/112,785	ART29
PO8501	6,137,500	ART30
PO8500	09/112,796	ART31

12/9/02

CROSS-REFERENCED AUSTRALIAN PROVISIONAL PATENT APPLICATION NO.	US PATENT/PATENT APPLICATION (CLAIMING RIGHT OF PRIORITY FROM AUSTRALIAN PROVISIONAL APPLICATION)	DOCKET NO.
PO7987	09/113,071	ART32
PO8022	09/112,824	ART33
PO8497	09/113,090	ART34
PO8020	09/112,823	ART38
PO8023	09/113,222	ART39
PO8504	09/112,786	ART42
PO8000	09/113,051	ART43
PO7977	09/112,782	ART44
PO7934	09/113,056	ART45
PO7990	09/113,059	ART46
PO8499	09/113,091	ART47
PO8502	09/112,753	ART48
PO7981	6,317,192	ART50
PO7986	09/113,057	ART51
PO7983	09/113,054	ART52
PO8026	09/112,752	ART53
PO8027	09/112,759	ART54
PO8028	09/112,757	ART56
PO9394	09/112,758	ART57
PO9396	09/113,107	ART58
PO9397	6,271,931	ART59
PO9398	6,353,772	ART60
PO9399	6,106,147	ART61
PO9400	09/112,790	ART62
PO9401	6,304,291	ART63
PO9402	09/112,788	ART64
PO9403	6,305,770	ART65
PO9405	6,289,262	ART66
PP0959	6,315,200	ART68
PP1397	6,217,165	ART69
PP2370	09/112,781	DOT01
PP2371	09/113,052	DOT02
PO8003	09/112,834	Fluid01
PO8005	09/113,103	Fluid02
PO9404	09/113,101	Fluid03
PO8066	6,227,652	IJ01
PO8072	6,213,588	IJ02
PO8040	6,213,589	IJ03
PO8071	6,231,163	IJ04
PO8047	6,247,795	IJ05
PO8035	09/113,099	IJ06
PO8044	6,244,691	IJ07

ART42 Annotated

CROSS-REFERENCED AUSTRALIAN PROVISIONAL PATENT APPLICATION No.	US PATENT/PATENT APPLICATION (CLAIMING RIGHT OF PRIORITY FROM AUSTRALIAN PROVISIONAL APPLICATION)	DOCKET No.
PO8063	6,257,704	IJ08
PO8057	09/112,778	IJ09
PO8056	6,220,694	IJ10
PO8069	6,257,705	IJ11
PO8049	6,247,794	IJ12
PO8036	6,234,610	IJ13
PO8048	6,247,793	IJ14
PO8070	6,264,306	IJ15
PO8067	6,241,342	IJ16
PO8001	6,247,792	IJ17
PO8038	6,264,307	IJ18
PO8033	6,254,220	IJ19
PO8002	6,234,611	IJ20
PO8068	09/112,808	IJ21
PO8062	6,283,582	IJ22
PO8034	6,239,821	IJ23
PO8039	09/113,083	IJ24
PO8041	6,247,796	IJ25
PO8004	09/113,122	IJ26
PO8037	09/112,793	IJ27
PO8043	09/112,794	IJ28
PO8042	09/113,128	IJ29
PO8064	09/113,127	IJ30
PO9389	6,227,653	IJ31
PO9391	6,234,609	IJ32
PP0888	6,238,040	IJ33
PP0891	6,188,415	IJ34
PP0890	6,227,654	IJ35
PP0873	6,209,989	IJ36
PP0993	6,247,791	IJ37
PP0890	09/112,764	IJ38
PP1398	6,217,153	IJ39
PP2592	09/112,767	IJ40
PP2593	6,243,113	IJ41
PP3991	6,283,581	IJ42
PP3987	6,247,790	IJ43
PP3985	6,260,953	IJ44
PP3983	6,267,469	IJ45
PO7935	6,224,780	IJM01
PO7936	6,235,212	IJM02
PO7937	6,280,643	IJM03
PO8061	6,284,147	IJM04

CROSS-REFERENCED AUSTRALIAN PROVISIONAL PATENT APPLICATION NO.	US PATENT/PATENT APPLICATION (CLAIMING RIGHT OF PRIORITY FROM AUSTRALIAN PROVISIONAL APPLICATION)	DOCKET NO.
PO8054	6,214,244	IJM05
PO8065	6,071,750	IJM06
PO8055	6,267,905	IJM07
PO8053	6,251,298	IJM08
PO8078	6,258,285	IJM09
PO7933	6,225,138	IJM10
PO7950	6,241,904	IJM11
PO7949	09/113,129	IJM12
PO8060	09/113,124	IJM13
PO8059	6,231,773	IJM14
PO8073	6,190,931	IJM15
PO8076	6,248,249	IJM16
PO8075	09/113,120	IJM17
PO8079	6,241,906	IJM18
PO8050	09/113,116	IJM19
PO8052	6,241,905	IJM20
PO7948	09/113,117	IJM21
PO7951	6,231,772	IJM22
PO8074	6,274,056	IJM23
PO7941	09/113,110	IJM24
PO8077	6,248,248	IJM25
PO8058	09/113,087	IJM26
PO8051	09/113,074	IJM27
PO8045	6,110,754	IJM28
PO7952	09/113,088	IJM29
PO8046	09/112,771	IJM30
PO9390	6,264,849	IJM31
PO9392	6,254,793	IJM32
PP0889	6,235,211	IJM35
PP0887	09/112,801	IJM36
PP0882	6,264,850	IJM37
PP0874	6,258,284	IJM38
PP1396	09/113,098	IJM39
PP3989	6,228,668	IJM40
PP2591	6,180,427	IJM41
PP3990	6,171,875	IJM42
PP3986	6,267,904	IJM43
PP3984	6,245,247	IJM44
PP3982	09/112,835	IJM45
PP0895	6,231,148	IR01
PP0870	09/113,106	IR02
PP0869	09/113,105	IR04

CROSS-REFERENCED AUSTRALIAN PROVISIONAL PATENT APPLICATION NO.	US PATENT/PATENT APPLICATION (CLAIMING RIGHT OF PRIORITY FROM AUSTRALIAN PROVISIONAL APPLICATION)	DOCKET NO.
PP0887	09/113,104	IR05
PP0885	6,238,033	IR06
PP0884	09/112,766	IR10
PP0886	6,238,111	IR12
PP0871	09/113,086	IR13
PP0876	09/113,094	IR14
PP0877	09/112,760	IR16
PP0878	6,196,739	IR17
PP0879	09/112,774	IR18
PP0883	6,270,182	IR19
PP0880	6,152,619	IR20
PP0881	09/113,092	IR21
PO8006	6,087,638	MEMS02
PO8007	09/113,093	MEMS03
PO8008	09/113,062	MEMS04
PO8010	6,041,600	MEMS05
PO8011	09/113,082	MEMS06
PO7947	6,067,797	MEMS07
PO7944	09/113,080	MEMS09
PO7946	6,044,646	MEMS10
PO9393	09/113,065	MEMS11
PP0875	09/113,078	MEMS12
PP0894	09/113,075	MEMS13

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

Not applicable.

FIELD OF THE INVENTION

The present invention relates to digital image processing and in particular discloses Camera System Containing a VLIW Vector Processor.

Further the present invention relates to an image processing method and apparatus and, in particular, discloses a Digital Instant Camera with Image Processing Capability.

The present invention further relates to the field of digital camera technology and, particularly, discloses a digital camera having an integral color printer.

BACKGROUND OF THE INVENTION

Traditional camera technology has for many years relied upon the provision of an optical processing system which relies on a negative of an image which is projected onto a photosensitive film which is subsequently chemically processed so as to "fix" the film and to allow for positive prints to be produced which reproduce the original image. Such an image processing technology, although it has become a standard, can be unduly complex, as expensive and difficult technologies are involved in full color processing of images. Recently, digital cameras have become available. These cameras normally rely upon the utilization of a charged coupled device (CCD) to sense a particular image. The camera normally includes storage media for the storage of the sensed scenes in addition to a connector for the transfer of images to a computer device for subsequent manipulation and printing out.

Such devices are generally inconvenient in that all images must be stored by the camera and printed out at some later stage. Hence, the camera must have sufficient storage capabilities for the storing of multiple images and, additionally, the user of the camera must have access to a subsequent computer system for the downloading of the images and printing out by a computer printer or the like.

Further, digital camera devices have only limited on board processing capabilities which can only perform limited manipulation of sensed image. The main function of the on board processing capability is to store the sensed image. As it may be desirable to carry out extensive modification of an image, the capabilities of such digital camera devices are considered inadequate.

SUMMARY OF THE INVENTION

The present invention relates to the provision of a digital camera system having significant on-board computational capabilities for the manipulation of images.

In accordance with a first aspect of the present invention, there is provided a hand held digital camera [system] comprising [a] an image sensing means for sensing an image; modification means for modifying the sensed image in accordance with modification instructions input into the camera from an inbuilt input means; and an output means for printing out [outputting] the modified image; wherein the modification means includes a series of processing elements arranged around a central crossbar switch. Preferably, the processing elements include an Arithmetic Logic Unit (ALU) acting under the control of a microcode store wherein the microcode store comprises a writeable control store. The

processing elements can include an internal input and output FIFO for storing pixel data utilized by the processing elements and the modification is interconnected to a read and write FIFO for reading and writing pixel data of images to the modification means.

Each of the processing elements can be arranged in a ring and each element is also separately connected to its nearest neighbours. The ALU accepts a series of inputs interconnected via an internal crossbar switch to a series of core processing units within the ALU and includes a number of internal registers for the storage of temporary data. The core processing units can include at least one [one] of a multiplier, an adder and a barrel shifter.

The processing elements are further connected to a common data bus for the transfer of pixel data to the processing elements and the data bus is interconnected to a data cache which acts as an intermediate cache between the processing elements and a memory store for storing the images.

BRIEF DESCRIPTION OF THE DRAWINGS

Notwithstanding any other forms which may fall within the scope of the present invention, preferred forms of the invention will now be described, by way of example only, with reference to the accompanying drawings in which:

Fig. 1 illustrates an Artcam device constructed in accordance with the preferred embodiment;

Fig. 2 is a schematic block diagram of the main Artcam electronic components;

Fig. 3 is a schematic block diagram of the Artcam Central Processor;

Fig. 3(a) illustrates the VLIW Vector Processor in more detail;

Fig. 4 illustrates the Processing Unit in more detail;

Fig. 5 illustrates the ALU 188 in more detail;

Fig. 6 illustrates the In block in more detail;

Fig. 7 illustrates the Out block in more detail;

Fig. 8 illustrates the Registers block in more detail;

Fig. 9 illustrates the Crossbar1 in more detail;

Fig. 10 illustrates the Crossbar2 in more detail;

Fig. 11 illustrates the read process block in more detail;

Fig. 12 illustrates the read process block in more detail;

Fig. 13 illustrates the barrel shifter block in more detail;

Fig. 14 illustrates the adder/logic block in more detail;

Fig. 15 illustrates the multiply block in more detail;

Fig. 16 illustrates the I/O address generator block in more detail;

Fig. 17 illustrates a pixel storage format;

Fig. 18 illustrates a sequential read iterator process;

golf course information, news broadcast, comics, weather details etc.

For example, the ArtCards could include a book's contents or a newspaper's contents. An example of such a system is as illustrated in Fig. Z35 wherein the ArtCards 70 includes a book title on one surface with the second surface having the encoded contents of the book printed thereon. The card 70 is inserted in the reader 72 which can include a flexible display 73 which allows for the folding up of card reader 72. The card reader 72 can include display controls 74 which allow for paging forward and back and other controls of the card reader 72.

Ink Jet Technologies

The embodiments of the invention use an ink jet printer type device. Of course many different devices could be used. However presently popular ink jet printing technologies are unlikely to be suitable.

The most significant problem with thermal ink jet is power consumption. This is approximately 100 times that required for high speed, and stems from the energy-inefficient means of drop ejection. This involves the rapid boiling of water to produce a vapor bubble which expels the ink. Water has a very high heat capacity, and must be superheated in thermal ink jet applications. This leads to an efficiency of around 0.02%, from electricity input to drop momentum (and increased surface area) out.

The most significant problem with piezoelectric ink jet is size and cost. Piezoelectric crystals have a very small deflection at reasonable drive voltages, and therefore require a large area for each nozzle. Also, each piezoelectric actuator must be connected to its drive circuit on a separate substrate. This is not a significant problem at the current limit of around 300 nozzles per print head, but is a major impediment to the fabrication of [pagewide] pagewidth print heads with 19,200 nozzles.

Ideally, the ink jet technologies used meet the stringent requirements of in-camera digital color printing and other high quality, high speed, low cost printing applications. To meet the requirements of digital photography, new ink jet technologies have been created. The target features include:

low power (less than 10 Watts)
high resolution capability (1,600 dpi or more)
photographic quality output
low manufacturing cost
small size (pagewidth times minimum cross section)

high speed (< 2 seconds per page).

All of these features can be met or exceeded by the ink jet systems described below with differing levels of difficulty. [45] Forty-five different ink jet technologies have been developed by the Assignee to give a wide range of choices for high volume manufacture. These technologies form part of separate applications assigned to the present Assignee as set out in the table [below] under the heading Cross References to Related Applications.

The ink jet designs shown here are suitable for a wide range of digital printing systems, from battery powered one-time use digital cameras, through to desktop and network printers, and through to commercial printing systems

For ease of manufacture using standard process equipment, the print head is designed to be a monolithic 0.5 micron CMOS chip with MEMS post processing. For color photographic applications, the print head is 100 mm long, with a width which depends upon the ink jet type. The smallest print head designed is IJ38, which is 0.35 mm wide, giving a chip area of 35 square mm. The print heads each contain 19,200 nozzles plus data and control circuitry.

Ink is supplied to the back of the print head by injection molded plastic ink channels. The molding requires 50 micron features, which can be created using a lithographically micromachined insert in a standard injection molding tool. Ink flows through holes etched through the wafer to the nozzle chambers fabricated on the front surface of the wafer. The print head is connected to the camera circuitry by tape automated bonding.

Tables of Drop-on-Demand Ink Jets

Eleven important characteristics of the fundamental operation of individual ink jet nozzles have been identified. These characteristics are largely orthogonal, and so can be elucidated as an eleven dimensional matrix. Most of the eleven axes of this matrix include entries developed by the present assignee.

The following tables form the axes of an eleven dimensional table of ink jet types.

Actuator mechanism (18 types)

Basic operation mode (7 types)

Auxiliary mechanism (8 types)

Actuator amplification or modification method (17 types)

Actuator motion (19 types)

Nozzle refill method (4 types)

Method of restricting back-flow through inlet (10 types)

Nozzle clearing method (9 types)

Nozzle plate construction (9 types)

Drop ejection direction (5 types)

Ink type (7 types)

The complete eleven dimensional table represented by these axes contains 36.9 billion possible configurations of ink jet nozzle. While not all of the possible combinations result in a viable ink jet technology, many million configurations are viable. It is clearly impractical to elucidate all of the possible configurations. Instead, certain ink jet types have been investigated in detail. These are designated IJ01 to IJ45 [above] which match the docket numbers in the table under the heading Cross References to Related Applications.

Other ink jet configurations can readily be derived from these [45] forty-five examples by substituting alternative configurations along one or more of the 11 axes. Most of the IJ01 to IJ45 examples can be made into ink jet print heads with characteristics superior to any currently available ink jet technology.

Where there are prior art examples known to the inventor, one or more of these examples are listed in the examples column of the tables below. The IJ01 to IJ45 series are also listed in the examples column. In some cases, a [printer] print technology may be listed more than once in a table, where it shares characteristics with more than one entry.

Suitable applications for the ink jet technologies include: Home printers, Office network printers, Short run digital printers, Commercial print systems, Fabric printers, Pocket printers, Internet WWW printers, Video printers, Medical imaging, Wide format printers, Notebook PC printers, Fax machines, Industrial printing systems, Photocopiers, Photographic minilabs etc.

The information associated with the aforementioned 11 dimensional matrix are set out in the following tables.

orientation of the sheets has been changed from landscape to portrait

ACTUATOR MECHANISM (APPLIED ONLY TO SELECTED INK DROPS)				
	Description	Advantages	Disadvantages	Examples
Thermal bubble	An electrothermal heater heats the ink to above boiling point, transferring significant heat to the aqueous ink. A bubble nucleates and quickly forms, expelling the ink. The efficiency of the process is low, with typically less than 0.05% of the electrical energy being transformed into kinetic energy of the drop.	♦ Large force generated ♦ Simple construction ♦ No moving parts ♦ Fast operation ♦ Small chip area required for actuator	♦ High power ♦ Ink carrier limited to water ♦ Low efficiency ♦ High temperatures required ♦ High mechanical stress ♦ Unusual materials required ♦ Large drive transistors ♦ Cavitation causes actuator failure ♦ Kogation reduces bubble formation ♦ Large print heads are difficult to fabricate	♦ Canon Bubblejet 1979 Endo et al GB patent 2,007,162 ♦ Xerox heater-in-pit 1990 Hawkins et al USP 4,899,181 ♦ Hewlett-Packard TIJ 1982 Vaught et al USP 4,490,728